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Client/Server Architecture

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The problem arises when, in the course of the transaction, both a client and a server modify their respective resources. If both the client and the server have been successful in their parts of a transaction process, they can commit the changes to transaction resources, thus making the changes permanent. If one of the client/server interaction partners (a client process or a server process) fails, another partner should reverse the changes made in the course of the transaction to the original state the resources were in before the transaction started.

These rules are called a two-phase commit protocol. Even though it is often associated with distributed database processing, the two-phase commit protocol is an issue of distributed transaction processing. Two-phase commit protocol guarantees the integrity of the transaction resources. One of the best-known implementations of this protocol is IBM's CICS (Customer Information Control System) Distributed Transaction Processing (DTP). CICS DTP uses IBM's Logical Unit type 6.2 (LU6.2), also known as Advanced Program-to-Program Communications (APPC). APPC/LU6.2, two-phase commit, and interprocess synchronization are described in greater detail later in the book.

2.5 DISTRIBUTED DATA

So far, the analysis of the distribution of application components has concentrated on the presentation, business, and database logic. Each of these components, however, deals with data. Database logic accesses the data from a DBMS, business logic processes the data, and presentation logic displays the data to end users. In fact, the processing of data is the main purpose of an application. Several vital questions relate to the issues of the distributed data in a client/server environment. Some of these questions are:

- Is the data distributed or centralized?
- What role does a database server play?
- Where is the data located if distributed?
- How is the data fragmented if distributed?
- Is data replicated in multiple locations, and if so, how are all the copies kept current?
- How can data in multiple locations can be accessed in an application-transparent fashion?
- How can data integrity and availability be guaranteed?
- What are the data administration issues in a distributed environment?

These and other data-related issues are extremely important in understanding a client/server architecture and are analyzed in Part 4 of this book. However, the question of whether data is located on client or on server systems can be answered now.

Direct and Indirect Connections. As the client/server architecture evolved from shared-device processing, one of its main objectives was to allow a client-based application to access remote data efficiently. That access is provided by a *database server.* A database server contains the DBMS software and the data (database) itself:

- DBMS software, by its nature, is designed to be common, shared software.
- In a client/server environment the server is the focal point of all client requests.
- Advanced DBMS implementations allow for the placement of common procedures and even certain business rules into the server DBMS, which necessitates its central position in a client/server architecture.
- In a workgroup environment, the majority of the data to be processed needs to be shared among all clients.
- Advanced DBMS implementations include DBMS-resident data dictionaries that facilitate application development, support data location transparency, and provide for more efficient data administration.
- Placing data and the DBMS together on a database server makes it easier to implement facilities that provide data integrity and availability.

Therefore, the proper architectural decision would be to place the DBMS software and all shared data on a database server.

At the same time, if client applications require some unique, applications- and client-specific data, the proper place for it would be a data store located in a client system. These two situations would determine the way a client application could connect to a server running a DBMS. With the direct application-to-DBMS connection, the *client* application would use communication protocols and some kind of remote transaction processing to *request* a server-resident DBMS to access data. This situation can become more complicated if multiple servers have to be accessed.

- An application could use distributed transaction processing to establish sessions with multiple servers.

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